The chapter on animal parasites is of interest, and will be eagerly perused by those for whom this book is written; so will the illustrations and descriptions of insect weapons and tools, although this chapter might with great ease have been made more popular by many added illustrations from familiar sources.

The book is well printed on good paper and admirably bound. It would make a useful and desirable present, and will, we believe, be read with pleasure by the general public, who will find that it opens a new world of facts and suggestions to them. D.

## *M. TSYBIKOFF'S JOURNEY TO LHASSA.*

IN the latest number of the *Izvestia* of the Russian Geographical Society (1903, iii.) there is a very interesting paper, by M. G. Ts. Tsybikoff, on his journey to Central Tibet and his stay at the city of the Dalai-lama, Lhassa, the unattained goal of so many European travellers. M. Tsybikoff is a Russian Buryate by birth, and a Lamaite by religion, who studied at the Oriental faculty of a Russian university, and after having carefully prepared himself for this journey went to Tibet, as so many Buryate pilgrims do. He stayed on his way through Mongolia in two of the most renowned Mongolian monasteries, and on August 1, 1900, entered the holy precincts of Central Tibet without any difficulty. It was on the northern slope of the Bumza Pass, on the San-chu River. From this spot the caravan travelled south-westwards through the broad and open, extremely high and dry valleys of Central Tibet, where cereals are nevertheless grown by means of irrigation, and on August 16 they entered the holy city, after a three months' journey from the Gumbum Monastery, and a 370 miles' journey through Tibet proper.

At Lhassa M. Tsybikoff stayed more than twelve months, until September 23, 1901, and from that city he made an excursion so far as Tsetan, or Chetan, visiting, besides the three great monasteries situated round Lhassa—Braibun (8500 monks), Sera (5000 monks) and Galdan (2000 to 2500 monks)—also the monasteries of Dashi-lhunbo (170 miles from Lhassa, on the right bank of the Brahmaputra) and Sam-yai, on the left bank of the same river, about 67 miles south-east of Lhassa, one of the oldest in Tibet, as it was founded in the ninth century. He also visited the towns Shiha-tse, Chan-tse, and Tsetan.

The descriptions which the Russian traveller gives of Lhassa and its sanctuaries, as well as of the monasteries already mentioned, the population, its composition and its ways of living, the Government and administration, and the climate of the country—meteorological observations were made thrice a day without interruption for 235 days—are extremely interesting. The estimates of population hitherto given have been very much exaggerated, and M. Tsybikoff takes the number as not exceeding two and a half millions, out of whom one million are living in the two provinces U and Tsan. Lhassa has no more than 10,000 inhabitants, two-thirds of whom are women, its population having been overestimated on account of the 15,000 to 16,000 monks staying in the three above-named monasteries and the numbers of pilgrims.

During his stay at Lhassa M. Tsybikoff made an extremely valuable collection of 317 volumes (now in the hands of the St. Petersburg Academy of Sciences) of Tibetan books on philosophy, medicine, astronomy, history and geography, as also of prayers and incantations, written by the most renowned lamas for the last nine centuries.

The paper is illustrated by nine excellent photographs, representing views of Lhassa, the palace of the Dalai-lama, and the monasteries of Galdan and Dashi-lhunbo. The pictures are taken from the collection of M. Norzunoff, a Kalmyk pilgrim who also was at Lhassa in the same year, and brought back forty-five photographs. M. Tsybikoff's collection (twenty-one photos) reached the Russian Geographical Society after the views mentioned above had been printed.

Those who are interested in Tibet will be glad to know that, besides the diary of the Buryate Zayaeff, who visited Central Tibet in the eighteenth century, the diary of the Kalmyk Baza-bakshi Menkejieff was published in 1897, with a Russian translation by Prof. Pozdnéeff.

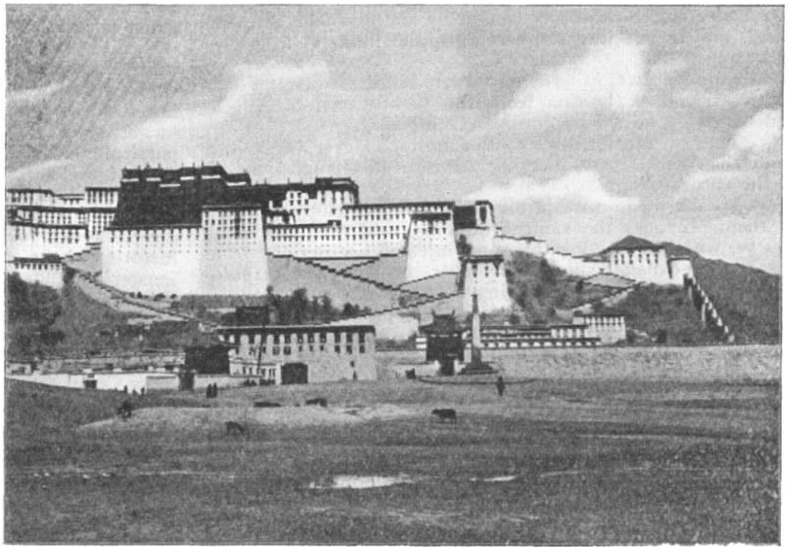

FIG. 1.—Bodala, the palace of the Dalai-lama at Lhassa, seen from the south. (It is built on the cliff Mar-bo-ri, which rises above the plain of the Ui-chu River, about two-thirds of a mile from the city itself).

## *ANNIVERSARY MEETING OF THE ROYAL SOCIETY.*

AT the anniversary meeting of the Royal Society on Monday, the officers and council for the year were elected, the report of the council was read, and the president delivered his address. In the following list of the elected council, the names of new members are printed in italics:—

President, Sir William Huggins, K.C.B.; Treasurer, Mr. A. B. Kempe; Secretaries: Prof. Joseph Larmor and *Sir Archibald Geikie*; Foreign Secretary, Mr. Francis Darwin. Other Members of the Council: *Mr. G. A. Boulenger, Prof. J. R. Bradford,* Prof. H. L. Callendar, *Mr. F. W. Dyson,* Prof. H. B. Dixon, Sir Michael Foster, K.C.B., *Prof. P. F. Frankland, Sir Robert Giffen, K.C.B., Prof. W. D. Halliburton, Dr. E. W. Hobson,* Prof. J. W.

Judd, C.B., Prof. G. D. Liveing, Prof. A. E. H. Love, *Mr. Adam Sedgwick, Dr. W. N. Shaw,* Capt. T. H. Tizard, R.N., C.B.

The report of the council refers, among other matters, to the work of the National Physical Laboratory and the scientific results obtained, the International Association of Academies, the International Catalogue of Scientific Literature, International Aëronautics, and sleeping sickness.

In February last, Lieut.-Colonel Bruce, F.R.S., went to Uganda to study sleeping sickness, with Dr. Nabarro as bacteriologist. Soon after their arrival, Dr. Castellani, who was then in Uganda, reported to Colonel Bruce that during the past five months he had observed trypanosomes in the cerebro-spinal fluid of cases of sleeping sickness, and a telegram was received from Colonel Bruce in April stating that he considered it very probable that a trypanosome was the cause of the disease.

Since then a report entitled "Progress Report on Sleeping Sickness in Uganda" has been received and published as No. 2 Report of the Sleeping Sickness Committee.

Colonel Bruce returned to England in September, bringing with him a further report which adduces evidence that—

(1) Sleeping Sickness is caused by the entrance into the blood, and thence into the cerebro-spinal fluid, of a species of trypanosoma.

(2) This species is probably that discovered by Forde and described by Dutton from the West Coast of Africa, and called by him *Trypanosoma Gambiense.*

(3) The so-called cases of trypanosoma fever, described from the West Coast, may be cases of Sleeping Sickness in the earliest stages.

(4) Monkeys are susceptible to Sleeping Sickness, which in them produces the same symptoms, and runs the same course, whether the trypanosomes injected are derived from cases of so-called trypanosoma fever, or from the cerebro-spinal fluid of cases of Sleeping Sickness.

(5) Dogs and rats are partially susceptible, but guinea-pigs, donkeys, oxen, goats, and sheep, up to the present, have shown themselves absolutely refractory.

(6) The trypanosomes are transmitted from the sick to the healthy by a species of tsetse fly, *Glossina palpalis,* and by it alone.

(7) The distribution of Sleeping Sickness and *Glossina palpalis* correspond.

(8) Sleeping Sickness is, in short, a human tsetse fly disease.

In the course of his address, the president referred to the portrait of Lord Rayleigh, painted by Sir George Reid, which was formally presented to the society at Monday's meeting, and to the retirement of Sir Michael Foster, the senior secretary. A large part of the address was devoted to suggestions which have been made to affiliate important special or local societies with the Royal Society. A committee appointed to consider the question some time ago decided that the Royal Society, both as to its administration and work, should remain as heretofore, and not enter into any formal relationship with special societies. Support was, however, given in the address to the need of integration in respect of publications of the Royal and other scientific societies. The joint publication of papers was brought before the council several years ago, but was not received with favour. It has since been found to work successfully with the Royal Astronomical Society, and the opinion is expressed that other societies might arrange for the duplicate publication, in their own *Transactions,* of papers communicated to the Royal Society of special interest to the respective special societies. This plan leaves each society to its complete independence, and does not involve the Royal Society in any obligation which would in any way interfere with its own free administrative working.

The work of this year's medallists was described in the address as follows:—

### COPLEY MEDAL.

The Copley Medal is awarded to Prof. Edward Suess, For. Mem. R.S., in recognition of his eminent services to Geology, and especially of his original researches and conclusions published in his great work, "Das Antlitz der Erde."

Prof. Suess was for 40 years Professor of Geology in Vienna University, and under his guidance a school of Geology has arisen, which is not surpassed in any country of the world. He has written numerous papers on Stratigraphical and Physical Geology, and has published much valuable palæontological work. The results of many years of study were contained in "Die Entstehung der Alpen," published in 1875. In this book he traced the geological history of the Central European ranges, and applied the results of his inquiry to the problems of mountain formation and surface contours in general. This work was followed, in 1885, by the first volume of "Das Antlitz der Erde," in which the same problems were attacked on a wider field. The second volume was published in 1888, but the first part of the third volume was not issued until 1901. In this great work the study of the changes that have taken place during geological times in the oceans and seas of the globe is combined with inquiry into alterations in the form of the solid surface. Owing to the wonderful grasp of the subject, and the striking originality shown, the work has influenced geological thought to an extent that has seldom been equalled.

Many geologists have distinguished themselves by mastering the geological structure of different countries, small or large, or have devoted their energies to the solution of particular problems; Suess has aimed at giving an explanation of the surface features exhibited by the whole world, founded on an investigation of its geological history. The forms of continents and islands, the distribution and direction of mountain ranges, the profiles, contours, and histories of the great oceans—all are treated by him with a master's hand. "Das Antlitz der Erde" represents the culmination of the Geology of the nineteenth century; as has been most aptly said by Marcel Bertrand in his preface to the French translation, it is the last term of the revolution commenced a century ago by Werner and Hutton.

### ROYAL MEDAL.

A Royal Medal is awarded to Sir David Gill, K.C.B., F.R.S., for his researches in Solar and Stellar Parallax, and his energetic direction of the Royal Observatory at the Cape of Good Hope.

Sir David Gill (H.M. Astronomer at the Cape Observatory since 1879) is specially distinguished for his researches on the distances of the heavenly bodies, although his other work has covered a large field. He has made four independent determinations of the sun's distance by heliometer observations of Mars (1877), Iris (1888), Victoria (1889), and Sappho (1889), being ably assisted in some of these investigations by others, but undertaking the greater part of the work himself. The four determinations agree wonderfully well in giving a solar parallax very near 8″·80, which has consequently been adopted for general use in national Ephemerides since the beginning of the present century. Incidentally this work gave improved values for other constants of the solar system, especially the lunar equation in the sun's motion; and it suggested that the time had arrived for an entirely new method of observing the places of the planets, which Sir David Gill has since initiated.

He has also determined the parallaxes of eleven stars of the first magnitude, and four stars of larger proper motion; and several similar determinations carried out by others have been inspired by Sir David Gill. And he has discussed the results from a cosmical point of view. In such work he takes a first place among astronomers.

In addition to these researches of the normal type, Sir David Gill, by his energy and enterprise, has placed the Cape Observatory in the front rank; so that for the first time in the annals of Astronomy we have now at length an observatory of the highest class in the Southern Hemisphere. He has brought up to date the current reductions, and has produced several valuable catalogues of stars, in which particular attention has been paid to the elimination of small errors, notably the "magnitude-equation," to which Sir David Gill was himself the first to direct attention. And he has completely photographed, on a moderate scale, the Southern Hemisphere. The plates were measured in Holland by Kapteyn, who has published the results recently in a valuable work, the "Cape Photographic Durchmusterung," for which Kapteyn received the Royal Astronomical Society's Gold Medal in February, 1902. It may be recalled that on that occasion Kapteyn expressed very warmly his indebtedness to Sir David Gill.

Sir David Gill had a large share in initiating the International Astrographic Chart; he has also been very active in superintending the Geodetic Survey in South Africa.

### Royal Medal.

The other Royal Medal is conferred upon Dr. Horace T. Brown, F.R.S., for his work on the chemistry of carbohydrates, and on the assimilation of carbonic acid by green plants.

His memoir (H. T. Brown and G. H. Morris, *Journ.* Chem. Soc., 1893) on the "Chemistry and Physiology of Foliage Leaves" is of value as confirming the rougher work of Sachs on the amount of carbohydrate assimilated per leaf area per unit of time, but especially as being the first thorough investigation into the manufacture and translocation of the various sugars in the green leaf. This paper also contributes to our knowledge of the action of diastase in the leaf; and in this connection may be mentioned the paper on the "Germination of the Gramineæ" (H. T. Brown and G. H. Morris, *Journ.* Chem. Soc., 1890), which is a valuable contribution to the study of diastase and other enzymes.

His Presidential Address to the Chemical Section of the British Association, 1899, gave an account of work of the highest interest to botanists, such as the relation between the amount of assimilation of carbon and the partial pressure of the carbonic acid in the atmosphere, and the rate of absorption of carbonic acid by a leaf, as compared with the absorption by a solution of caustic alkali. These and other points are developed in the memoir on "Static Diffusion of Gases and Liquids in Plants" (H. T. Brown and F. Escombe, *Phil. Trans.*, 1900), which is one of the most important works on assimilation by plants that we possess. In this remarkable essay, Brown develops the principles determining the amount of diffusion from gases and solutions into absorbing surfaces, and shows that leaves conform in the size and number of the stomata to absorbing surfaces of high efficiency.

The earliest important chemical work of Horace Brown was on the influence of pressure on fermentation. He discovered that other gases besides carbonic acid were given off in the fermentation of malt worts and of grape sugar, and that the hydrogen evolved increased as the pressure was diminished. The formation of acetic acid during the fermentation out of contact with air was shown to be due to a direct transformation of the sugar into acetic acid.

In conjunction with Heron and Morris, he made a series of valuable investigations into the nature of starch and its transformations. He showed that the action of malt extract upon soluble starch might be represented by the *successive* removals of maltose by hydration (hydrolysis), the successively formed residues being a series of dextrins.

He was the first to apply Raoult's freezing-point method to the systematic determination of the molecular weights of the carbohydrates, and his measurements showed that soluble starch was much more complicated than the dextrins derived from it, the starch molecule possibly consisting of four complex amylin-groups arranged round a similar fifth group. But later work on dextrinic acid led to the view that the starch molecule is made up of the residues of 80 *maltan* groups and 40 *dextran* groups, linked in ring form through oxygen atoms, and that the maltan portion of the ring is attacked by successive stages of hydrolysis, forming dextrins and finally maltose. The molecular weight of starch cannot be less, according to these experiments, than 32,400.

The investigation of "secondary fermentation" produced by a small quantity of dried hops in beer led to his important work on the chemistry and physiology of foliage leaves, in which he gives reasons for supposing that cane-sugar is the first sugar to be synthesised by the assimilatory processes, and that this is the starting point of the metabolic changes in the leaf.

The discovery of the solution of the cell-membranes of grass seeds by a cellulose-dissolving enzyme secreted in the epithelium led him to investigate the corresponding action on the cell-walls of starch granules in the processes of animal digestion. After exhaustive experiments, he concluded that the cell-walls were attacked by an enzyme pre-existent in the grain.

### Davy Medal.

The Davy Medal for the most important discovery in chemistry is awarded to M. Pierre Curie, and Madame Curie, Docteur ès Sciences, for their researches on radium.

The discovery of radium—whether it be regarded from the point of view of the extraordinary properties of that substance, unique in their intensity if not in their kind, or of the undeviating aim and invincible patience with which the clue to its separation has been skilfully followed, or of the extended, even revolutionary, views of the constitution of matter and of the stores and transformations of energy in Nature which the study of its properties is opening up to us—may well be characterised as the most important discovery in chemistry of the present time.

### **Hughes Medal.**

The Hughes Medal is awarded to Prof. Johann Wilhelm Hittorf for his experimental researches on the electric discharge in liquids and gases, extending over a period of more than half a century into the present year.

The results of his work have been published in a series of papers, of which the first, on the electric conductivity of mercury, appeared in *Poggendorff's Annalen* so long ago as 1851, and was followed, in the years 1853 to 1859, by others, giving an account of his masterly investigations of the migrations of the ions in electrolysis. In conjunction with Plücker he took up the examination of the spectra emitted by gases under the influence of electric discharges from an induction coil, and communicated the results to the Royal Society in 1864; and in the ensuing twenty years he published, from time to time, a number of papers on electric conductivity in gases, which have greatly contributed to the advancement of our knowledge of that subject. In 1898 and 1899 he published papers on the electromotive behaviour of chromium and on the passive state of metals, and in the three years of the present century further papers on the rates of motion of the ions.

It is now the jubilee of the publication of his first paper on the last-named subject, a paper which marks an epoch in our knowledge of electrolysis. In that paper, and those which followed it in the next five years, by his careful measurements of the movements of the ions in a great variety of cases, he laid a solid foundation on which subsequent investigators have reared a large superstructure. The view of the constitution of electrolytes, and of chemical compounds in general, to which his research directly led, was so contrary to that in vogue amongst chemists at that time that it challenged opposition, but time has vindicated its accuracy and importance. His researches on electric conductivity in gases have been almost equally fruitful, for they have served as the starting point from which other observers have advanced, and have thus led up to modifications of our ideas of the constitution of matter quite as profound as those suggested by the migrations of the ions.

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## *PROF. ROBERT HENRY THURSTON.*

By the death of Prof. Robert Henry Thurston, which occurred with tragic suddenness on his birthday, October 26, the United States has lost its most distinguished engineering professor, and a devoted educationist whom it will be difficult to replace.

He was born at Providence, Rhode Island, in 1839, and was the son of Robert L. Thurston, the founder of the Providence Steam Co. His early training was of that twofold character which has been so much discussed during the last year or two, a collegiate education at the Brown University, where he gradu